Housing Consumption and Young Households' Residential Moves

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2003

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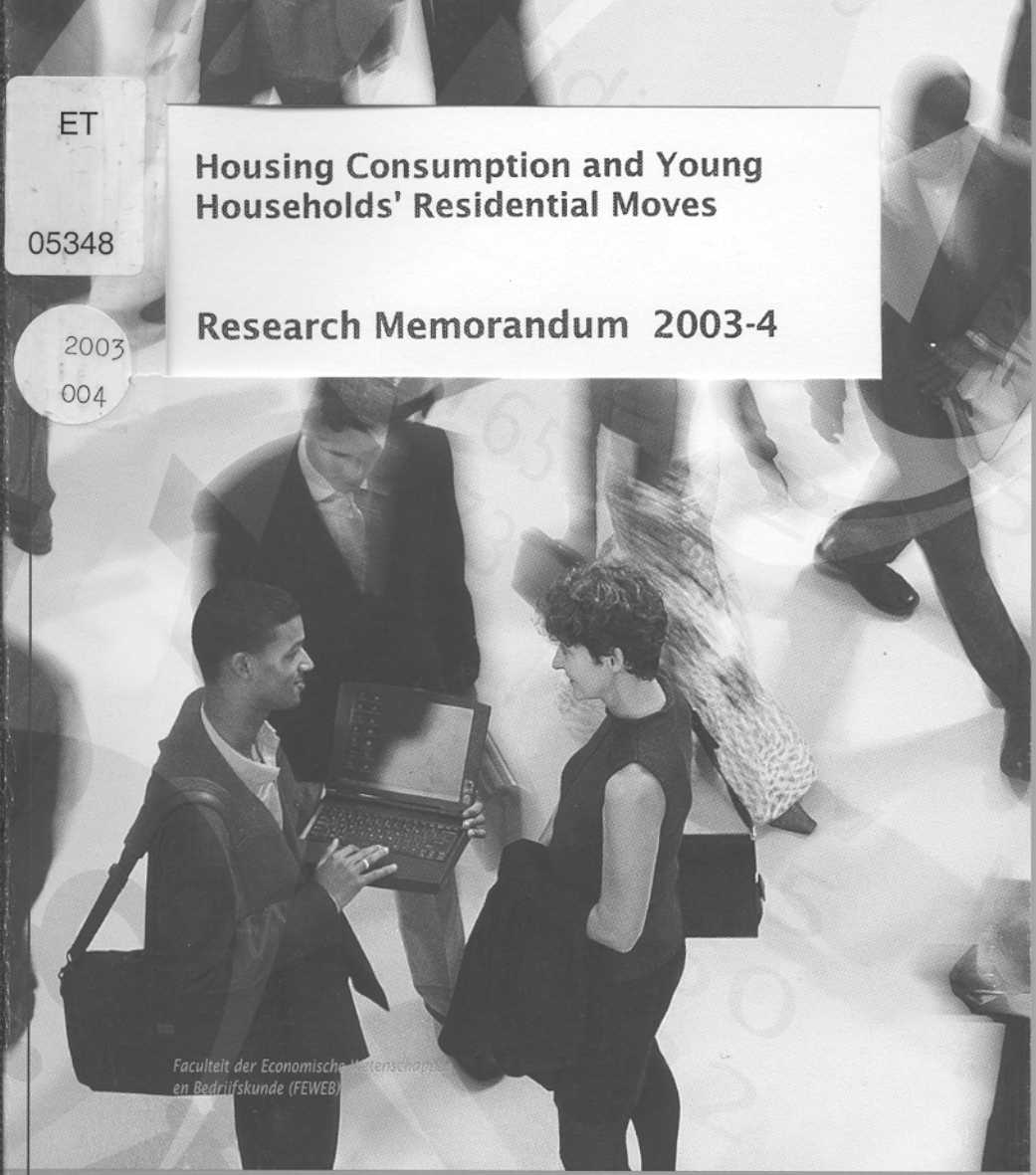
Research Memorandum 2003-4



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February 3, 2003

Abstract

The paper examines the impact of contextual factors on young households' residential moves. By dealing with young households' moves over a limited period of time enables us to show how differences in contextual factors determine differences in young households' residential mobility rates. A housing search model is outlined to explain housing consumption and mobility choices of young households.

In the empirical analysis a multi-spell mixed proportional hazard model is estimated on young households. Estimation results indicate that housing choices are set in a local housing and labor market context, affecting housing careers of young households most likely persisting through later stages in the life course. Differences in residential mobility rates are furthermore associated with synchronized changes in household composition, indicating the importance of the household demographics in housing market phenomena.

Key Words: household behavior, residential mobility, housing markets, housing career

JEL Code: D1, R24

1 Introduction

The dynamics of housing choice have been studied extensively by economists, geographers and sociologists. Economic theories of housing consumption dynamics consider intertemporal housing demand, relating housing choices to income and prices, emphasizing the rational economic behavior underlying residential mobility choices (See Venti and Wise, 1984; Amundsen, 1985; Henderson and Ioannides, 1989; Ioannides and Kan, 1996; Di Salvo and Ermisch, 1997; Börsch-Supan and Pollakowski, 1990; Jones, 1995; Aldershof, 1999; Van der Vlist et al., 2002a). Studies on residential mobility by geographers and sociologists give a central position to a variety of triggers associated with the life course in explaining residential mobility (see Rossi, 1955; Clark and Dieleman, 1996). These conceptually much more richer studies typically pay much less attention to underlying rational economic behavior of households to better understand household mobility choices.

Empirical studies on residential mobility basically relate residential mobility to changes in household composition and associated housing needs (Weinberg, 1979; Clark et al., 1986; Van der Vlist et al., 2002b), occupation (cf. Clark and Withers, 1999) and commuting (cf. Van Ommeren et al., 1999; Rouwendal and Van der Vlist, 2002). More recent contributions on residential mobility have emphasized cohort effects present in residential mobility, referring to the changing demographic dynamics and local housing market conditions across space and over time (see Myers, 1999; Clark et al., 2002). Systematic analysis on the interplay between residential mobility and the structure of the local economy is, however, much less extensive and is based on caseload studies (cf. Dieleman et al., 2000).

Understanding the link between local market factors and young households' residential mobility rates is important for several reasons. First, young households' residential moves and consequent vacancy chains play an important role in local government urban housing and redevelopment policy. Residential moves of young households to bigger dwellings give those who wish to enter the housing market and those housed unsatisfactorily the possibility of entering the housing market or improving their residence, respectively. Second, in housing markets with limited supply, as in many European cities, authorities intervene with rent-controls and rent assistance programs for the social rental housing sector. With a rental assistance program substantial amounts are associated with mismatches on the housing market. Third, restrictions on residential mobility have not only strong implications for the local housing market, but are also an important source of inefficiencies in the labor market (see among others Hughes and McCormick, 1987; Henley, 1998; Meen, 2001).

This paper empirically analyzes the housing adjustment process by considering young households' residential moves, and attempts to provide new

insights into contextual factors that shape housing careers. How can we understand differences in young households' mobility choices? Do synchronized changes in household composition explain variation, or are differences related to contextual factors? For this we consider young households' residential moves during the early 1990s. By dealing with residential moves over a limited period of time enables us to show how inter-regional differences in contextual factors shape residential mobility patterns under constant housing market conditions. Furthermore, analyzing residential moves of young households explicitly controls for the stage in the life course also precluding problems associated with initial conditions.

The paper is organized as follows. In Section 2 we discuss our theoretical framework to examine how transition rates are affected by household features and housing market conditions. In Section 3 we turn to our empirical application, discussing the main demographic, housing and labor market trends, the data, and, the statistical issues involved in estimating the model. The estimation results are presented in Section 4. Section 5 concludes.

2 Housing Consumption and Young Households' Residential Moves

Households' residential mobility choices are intimately related to housing consumption and housing tenure decisions. Changes in housing consumption, typically associated with moving, generally refer to changes in tenure, dwelling type, or dwelling size (cf. Börsch-Supan and Pollakowski, 1990; Wheaton, 1990; Clark et al., 2002). For housing, adjustments in consumption involve substantial search, transaction and moving costs. Due to these costs, households will usually not move immediately or every period after circumstances have changed. As a result, the housing consumption profile will typically be constant for longer periods between the two moves, and discontinuous at the moving dates (see Amundsen, 1985; Edin and Englund, 1991). One could reasonably argue that the higher the transaction costs the longer the periods between moves and the greater the jump in housing consumption at the moving date. Related, because transaction costs are generally assumed to be proportional to house value or rent, residential spells will be longer the greater the current housing consumption per unit time. Thus, even in case households are assumed to continuously search for a better dwelling this does not necessarily imply that they move each and every period. This is particularly true if liquidity constraints are (nearby) binding. Housing consumption in general depends centrally on a household's liquefiable wealth (see Jones, 1995; Henley, 1998). For young households, which are particularly vulnerable, (parental) assets, house prices and general sociodemographic factors are important determinants in mobility rates (cf. Börsch-Supan, 1986; Whittington and Peters, 1996; Ermisch and Di Salvo,

1997; Murphy and Wang, 1998; Ermisch, 1999; Andrew and Meen, 1999). The effect of assets on housing consumption adjustments and residential moves depend, however, on tenure. Unlike homeowners were both investment and housing expenditure motives play a role, is housing for renters associated with housing expenditure only (see Henderson and Ioannides, 1989). Increases in income generally enable upward adjustments in housing consumption. On the basis of these considerations one could argue that for both renters and homeowners, young households' residential moves are associated with an upward adjustment in housing consumption.

The natural starting point of the economic analysis of residential mobility is based on a utility framework, either in a deterministic or a stochastic environment (see among others Amundsen, 1985; Henderson and Ioannides, 1989, Ioannides and Kan, 1996). In a stochastic framework households - deriving utility from *inter alia* housing consumption- make a sequence of choices on tenure, dwelling size, and dwelling type as to maximize the discounted sum of expected utility (see also Van der Vlist et al., 2002a). Generally, the trade-off between these dimensions of housing are summarized into one index or measure of housing consumption h.

Over time, a household seeking out housing with better amenities receives opportunities to upgrade their housing. Depending on the offer, the household decides whether or not to accept the dwelling and move to the new residence, whereby no reconsideration of previously rejected offers is allowed. Throughout the paper, it is assumed that housing units arrive following a Poisson process at rate λ which depend on general housing market conditions. Housing offers are assumed to be independent and identical drawings from a density function $f(.)$ and associated distribution function $F(.)$. The associated value function for a household:

$$\rho V(h) = v(h) + \lambda \left\{ E_{h_x} \left(\max\{V(h_x), V(h)\} - TC \right) - V(h) \right\},$$

where λ denotes the arrival rate of market opportunities, $v(h)$ the instantaneous utility of the current dwelling, E_{h_x} denotes an expectation operator with respect to random housing consumption offers h_x, and TC denotes transaction costs associated with moving.

The interpretation of these equations is straightforward; expected lifetime utility depends on the utility of the current dwelling and the net utility if one moves. The optimal strategy is to accept every offer that improves on the existing residence

$$v(h^*) = v(h),$$

that is, the optimal strategy is to accept every opportunity that increases expected discounted lifetime utility. Residential mobility decisions are thus intertwined with the value households attach to housing amenities. Implicitly in the household's optimal strategy is the consideration of housing

market opportunities. Housing market conditions determine the arrival rate of new housing opportunities and therefore the length of residence. Also, in the presence of transaction costs households will not necessarily move in response to small changes in preferences or income as the moving costs need to be completely offset. The higher the transaction or moving costs, the longer the length of residence, *ceteris paribus*. When they move, however, their steps along the housing ladder will be bigger than if negligible transaction costs are involved.

The associated hazard rate of residential mobility θ for a household in a unit with utility level $v(h) = v(h^1)$, is:

$$\theta = \lambda \overline{F}(h^1),$$

with $\overline{F}(.) \equiv 1 - F(.)$.

The hazard rate of residential mobility, the probability that a household which has occupied a residence for a time t leaves in the short interval of length dt after t, is increasing in λ the number of market opportunities which depend on the local housing market structure and general economic conditions. Also, the arrival rate of suitable offers, λ, can be thought of as being increasing in income. Note also that the hazard rate decreases as the household moves up the housing ladder. To see this note that when a household moves up the housing ladder, the chance of improving residence, $\overline{F}(.)$, reduces. As a result, the hazard of residential mobility depends centrally on the housing quality of the household relative to the housing quality distribution of the local housing stock.

These insights from the residential search model suggest that in analyzing variation in residential mobility rates one should control for household characteristics that determine the value a household attach to housing amenities, local housing and labor market conditions, and characteristics of the local housing stock.

Household characteristics: one of the factors residential mobility is generally associated with are changes in household composition. Traditionally, residential choice and mobility have been linked to stages in family life course. Over time, a number of different changes may take place with respect to relationships or household size. Housing needs and the value households attach to housing amenities generally vary with these stages in the life course (Clark et al., 1986; Börsch-Supan and Pollakowski, 1990; Clark and Dieleman, 1996; Van der Vlist et al., 2002b). Changes in the household size and household composition increase residential mobility rates (cf. Mulder and Wagner, 1993). Clark et al. (1986) report that household composition and size, and thus space needs, vary over the life course, with increasing needs in the early stages but decreasing needs in later stages. Considering only

young households' residential mobility choices we explicitly control for age and associated stage in the life course.

Dwelling characteristics: adjustments in housing consumption are typically associated with residential moves. The changing space needs over the life course indicate that young households move more often if their house is small (cf. Clark and Dieleman, 1996; Henley, 1998). In addition, the tenure transition literature suggests that budget and borrowing constraints limit housing consumption in early years more often than in later years (cf. Jones, 1995). The literature on housing careers considers amenities like the number of rooms, dwelling type, tenure and rent/house price essential in the analysis of residential mobility (cf. Pickles and Davies, 1985; Pickles and Davies, 1986; Davies and Pickles, 1991; Clark et al., 2002). Combining these strands of literature one expects young households to move more often if their dwelling is of lower quality. From this perspective, one expects higher residential mobility rates in small apartments compared with those in large detached housing (see also Van der Vlist et al., 2002b).

Local housing and labor market characteristics: the process of residential relocation is embedded in, and influenced by, the housing-market conditions at the local level. The structure of local housing markets, including local land-use regulations relating to new-construction, allocation rules, and geographical factors, all have a great impact on residential mobility through the number of housing offers and the average selling price (Clark and Dieleman, 1996). Housing-market mobility and housing-market choices are set within the local economy which differ from region to region[1] (cf. Kendig, 1984; Henley, 1998; Dieleman et al., 2000; Hacker, 2000; Van der Vlist et al., 2002).

The results of Dieleman et al. (2000), considering the interplay between residential mobility and local housing market factors, indicate that regional variation in residential mobility are associated with differences in population growth, new construction, and the share of rental housing. Van der Vlist et al. (2002) relate residential mobility rates to differences in urbanization degree, local housing market regulations and housing market size. Differences in urbanization degree turn out to affect residential mobility decisions differently. Variations in mobility between different levels of urbanization are the result of not only in age, for example, but also in behavior and attitudes with respect to housing (see also Knapp et al., 2001). Moreover, regional house prices generally increase residential mobility rates of households (see Böheim and Taylor, 2002). Increases in regional house prices, however does not affect everyone equally; it is more likely that it increases residential mo-

[1]In relating households' mobility choices to aggregated market characteristics both endogenous effects and contextual effects need to be avoided (Manski, 1995). The presence of endogenus effects means that the household behaves in a way which depends on the prevalence of that behavior in the local housing market. With contextual effects, aggregate behavior is determined by the endogenous composition of that neighborhood.

bility rates for homeowners but decreases residential mobility rates for those who wish to move into first-time homeownership (cf. DiSalvo and Ermisch, 1997; Nelson, 2002).

Also, labor market characteristics like the regional unemployment rate, and the job-housing ratio turn out to be important in explaining variation in residential mobility rates. Generally, regional unemployment decrease the ability of households to sell and move elsewhere, decreasing residential mobility of households within local housing markets (see for example Di Salvo and Ermisch, 1997; Henley, 1998; Cameron and Muellbauer, 1998; Hacker, 2000). Yet, contradictory findings can be found as well (see Böheim and Taylor, 2002). These contradictory findings in the empirical literature basically depend on whether one considers inter- or intra-regional residential mobility rates. Whereas one expects a positive effect of unemployment on inter-regional mobility (migration), one expects a negative effect for intra-regional residential mobility. Two reasons for this negative effect can be given. First, for intra-regional mobility commuting is generally a substitute for moving residence (see Rouwendal and Van der Vlist, 2002). Moreover, intra-regional mobility are typically for housing consumption reasons. In regions or periods with higher unemployment, households generally refuse to increase housing consumption.

The regional jobs-housing ratio measures the number of jobs to the number of houses, providing a *potential* measure of regional housing market tightness (see Cervero, 1989). In general, tight housing markets make it more difficult for young households to find adequate housing, decreasing the arrival rate of housing opportunities and, *ceteris paribus*, the likelihood of moving.

3 Empirical Application

3.1 Demographics, Housing and Labor Market Dynamics

The steady increase in the total population and in the number of one-person households has led to an increase in the number of households by about 7.5 percent to 6,407,000 households in the 1990-1994 period (cf. VROM, 1994; SCP, 2000). Also, it is in this period that one can observe a slight increase in housing shortage in the Netherlands, when relating the total number of dwellings to the total number of independent households. Table 1 gives information on population, households and number of dwellings by region for 1990-1994.

Table 1 also indicates considerable regional variation in demographics and housing market dynamics; changes in population, the number of households and the number of dwellings have been rather uneven across geographical space. Population growth was highest in East, with North having the lowest population growth rate. East also showed the highest growth rate in the number of households and in the number of dwellings. Yet, the dwelling-household ratio is lowest for the East. The figures in Table 1 furthermore suggest hardly any changes in inter-regional differences in the dwelling-household ratio.

Qualitative information on the regional housing stock, presented in Table 2, indicate considerable inter-regional differences in the housing stock as well. The qualitative housing stock can be summarized in terms of dwelling type, dwelling size, tenure, and dwelling price/rent structure. The largest metropolitan housing markets of the Netherlands -all located in West- traditionally have a large social rental housing stock dominated by small, relatively cheap, apartments. As one can see from Table 2, other regions show more variation in dwelling type and size. Again, these figures indicate hardly any changes in the inter-regional differences in the housing stock over time.

What can be observed is the start of the late 1990s selling price rise in owner-occupier housing, leading to more pronounced inter-regional selling price differences. Because of the selling price rise, lock-in effects for homeowners are not very likely as these effects only occur during periods with declining selling prices when housing perform badly as an investment. The 1990-1994 price rise is highest for East and South, while lowest for North. In contrast, the figures on the average rent indicate hardly any change in the inter-regional rent structure.

Table 1: Population, households and number of dwellings by region, 1990-1994

	1990	1991	1992	1993	1994
Population (x 1000)					
North	1594.1	1598.1	1602.6	1607.7	1615
East	3036.1	3064.7	3094.0	3122.4	3149.7
South	3293.4	3318.8	3340.8	3363.4	3385.0
West	6967.2	7026.8	7089.7	6943.9	7190.4
Number of households (x 1000)					
North	634.4	642.4	653.2	661.2	671.8
East	1148.7	1171.4	1197.9	1225.4	1254.5
South	1254.9	1282.8	1304.5	1324.7	1348.9
West	2923.9	2976.4	3028.4	3084.2	3132.2
Number of dwellings (x 1000)					
North	625.6	633	639.4	645.9	653.2
East	1103.1	1123	1139.4	1157.6	1175.1
South	1231.3	1252	1269.4	1288	1304.7
West	2842.3	2884	2917.6	2952.9	2985.3
Dwelling - Household ratio					
North	0.99	0.99	0.98	0.98	0.97
East	0.96	0.96	0.95	0.94	0.94
South	0.98	0.98	0.97	0.97	0.97
West	0.97	0.97	0.96	0.96	0.95

Source:VROM, CBS Statline

Table 2: Regional decomposition of the Housing Stock, 1990-1994

	1990	1991	1992	1993	1994
Apartments (in %)					
North	18	18	18	18	18
East	16	16	16	16	16
South	16	16	16	16	16
West	45	44	43	43	43
Dwellings with at most three rooms (in %)					
North	24	24	24	24	24
East	19	19	19	19	20
South	18	18	18	18	18
West	32	32	32	31	31
Social rental housing (in %)					
North	39	38	38	38	37
East	34	33	33	33	32
South	39	39	39	38	38
West	40	40	40	40	40
Average selling price (x 1000 Euro)					
North	63.8	65.1	68.3	74.1	80.7
East	75.1	78.5	84.5	94.0	101.7
South	79.9	83.2	89.0	99.9	107.6
West	82.9	86.4	97.9	101.2	109.8
Average rent (in Euro/month)					
North	200.1	211.9	225.7	238.2	249.9
East	209.8	222.1	236.3	249.8	263.1
South	212.4	224.6	240.4	254.3	267.4
West	201.9	214.0	234.1	240.6	255.3

Source:VROM

The early 1990s labor market can be characterized by increased unemployment. The figures in Table 3 indicate considerable variation in the unemployment rate across space and over time. The unemployment rise being the highest in West and South -which had the lowest unemployment rate- led to less pronounced inter-regional differences in the unemployment rate. East had the lowest unemployment growth rate and the greatest rise in the number of jobs in this period. The job-housing ratio - relating the number of jobs to the number of dwellings - reveals interesting interregional differences over time. The figures indicate a rise in the job-housing ratio for East, no change for North and a decrease for both South and West.

To summarize the geography of demographics, housing and labor market dynamics: North which had the lowest growth rate in population, number of households, number of dwellings and in the number of jobs, experienced no

Table 3: Regional Labor market, 1990-1994

	1990	1991	1992	1993	1994
Unemployment rate (in %)					
North	8.9	8.0	8.8	9.6	10.2
East	7.2	6.6	6.3	7.3	8.2
South	6.4	6.2	6.1	7.3	8.0
West	6.6	6.2	6.4	7.3	8.4
Number of jobs (x 1000)					
North	496.1	500.5	506.4	503.1	513.0
East	980.2	1008.3	1027.8	1036.2	1053.4
South	1151.7	1166.4	1183.8	1195.2	1201.1
West	2676.1	2726.1	2779.6	2774.2	2773.5
Job-Housing ratio					
North	0.79	0.79	0.79	0.78	0.79
East	0.89	0.90	0.90	0.90	0.90
South	0.94	0.93	0.93	0.93	0.92
West	0.94	0.95	0.95	0.94	0.93

Source:CBS Statline, VROM

change in the job-housing ratio. In contrast, East experiencing the highest growth rate in population, number of households, number of dwellings and jobs, showed an increase in the job-housing ratio. The regions with average growth rates, *viz.* South and West, experienced a decline in the job-housing ratio. Whether these differences explain variation in young households' residential mobility rates is examined in the empirical analysis.

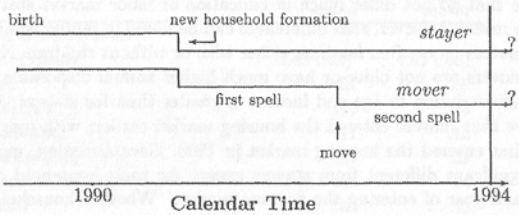

Figure 1: Residential duration data of newly formed households

3.2 Data

The Housing Demand Survey (HDS) contains extensive information on housing and households, including retrospective information on features of occupied dwellings and characteristics of the household itself (cf. CBS, 1995a,b). Since we are primarily interested in young households' residential moves and careers, only those observations are selected for which the participant is the principal occupant of the dwelling and who had formed a new household during the 1990-1994 observation period.

A schematic representation of the transition data is given in Figure 1. As the figure shows, HDS contains households who moved after they had formed a new household during the 1990-1994 observation period. For stayers, those households who did not move, the data gives information on the time of household formation, whereas for movers, those who did move, also the time of the residential move is known. Moreover, since the current residential spell is ongoing at the time of the questionnaire, right-censoring occurs at the end of the observation period for which cases the destination is not known. These right-censored spells are indicated in the figure with a question mark. In estimating the model, we take account of right-censoring in formulating the likelihood, which will be discussed later in this paper.

For residential spells of newly formed households, HDS contains information on dwellings and on regional and spatial characteristics for both spells. For a couple variables, viz. labor market status and education, only the value in the current spell is known. In the empirical analysis, we include only those time-variant, exogenous regressors for which we know the value at the beginning of each spell, as we assume regressors constant *within* spells (for a discussion on the inclusion of time-varying covariates, see Lancaster, 1990). Table 4 gives 1994 descriptive statistics of the subsample used in the estimation of the model.

First, note that the regional distribution of households in the sample

is representative for the national aggregate (see Table 1). Second, if stayers are compared with movers, one can see that we have a homogeneous sample that do not differ much in education or labor market status. The figures reveal, however, that differences can be found in family composition, with movers more often families, either with or without children. Note also, that movers are not older or have much higher annual disposable income, yet their variation in age and income is greater than for stayers. One can observe that movers entered the housing market earlier; with over 50 percent that entered the housing market in 1990. Recapitulating, movers are not significant different from stayers except for their household composition, and year of entering the housing market. Whether household-effects and cohort-effects are present in residential mobility patterns while controlling for differences in the regional housing stock as well as in the occupied dwelling is examined in the empirical analysis.

Table 4: 1994 Descriptive Statistics

	stayer	mover
Dwelling characteristics		
number of rooms	3.60 (.02)	4.05 (.08)
detached	.07	.09
semi-detached	.10	.19
corner dwelling	.11	.13
terraced dwelling	.24	.35
apartment	.47	.24
rental unit	.63	.48
highly urbanized area	.36	.38
urbanized area	.19	.15
rural area	.45	.47
North	.12	.19
East	.21	.17
South	.22	.22
West	.45	.42
Household characteristics		
age of the head (years)	26.77 (.96)	26.78 (3.37)
head	.21	.10
head and child	.01	.01
head and partner	.68	.70
head, partner and child	.10	.18
multiple household	.01	.01
Annual disposable income (in Euro)	20576 (223)	21401 (809)
Labor market status		
employed	.83	.79
unemployed	.06	.07
not-in-labor-force	.11	.14
Education		
low	.37	.36
intermediate	.47	.48
college or university	.16	.16
Year entering the housing market		
1990	.23	.51
1991	.25	.32
1992	.25	.14
1993	.26	.03
1994	.01	.00
Residential duration (months)		
first spell	35.22 (.29)	23.82 (.84)
second spell		22.14 (.68)
Number of households	2236	168

standard errors in parentheses

3.3 Empirical Model

In the empirical application, we consider new households' mobility rates by analyzing the length of time that the households have been in their dwellings. We use a multi-spell mixed proportional hazard model with hazard rate $\theta(t;x,v)$, which indicates the probability of moving residential location conditional on elapsed duration and unobserved heterogeneity[2]. The general specification reads:

$$\theta(t;x,v) = \psi(t)\theta(x)\nu, \tag{1}$$

with $\psi(t)$ a flexible baseline hazard; $\theta(x)$ a systematic part of the hazard; and, ν an unobserved heterogeneity term. The observed hazard function consists of a function $\psi(t)$, which gives the shape of the observed hazard function for any individual, and a systematic part of the hazard $\theta(x)$, which gives the level of the observed hazard. Following the discussion in section 2 $\theta(x)$ is assumed to be a function of household characteristics, dwelling characteristics, and regional housing and labor market characteristics. The last term of the conditional hazard function represents unobserved or omitted variables.

With regard to the baseline hazard $\psi(t)$, a piece-wise constant hazard function is used, to let the data suggest the form of the duration dependence structure (cf. Lancaster, 1990). As is well known, parametric specifications of the baseline hazard are overly restrictive (cf. Ridder, 1987). For example, the Exponential distribution is not able to capture duration dependence at all, whereas the Weibull specification is not flexible enough to capture all patterns of duration dependence. The hazard rate of residential mobility for household i over all time intervals m=1,..,M then reads:

$$\theta_i(t_i|x_i,\nu_i) = \exp\left(x_i'\beta\right)\exp\left(\sum_{m=1}^{M}\psi_m d_{im}(t)\right)\exp(\nu_i), \tag{2}$$

so that the integrated hazard function, $z(t|x,\nu) = \int_0^t \theta(u|x,\nu)du$, can be written:

$$z(t|x,v) = \exp(\psi_m + x'\beta + \nu)(t - c_{m-1}) + \sum_{i=1}^{m-1}\exp(\psi_m + x'\beta + \nu)(c_m - c_{m-1}). \tag{3}$$

The survivor function is $S(t|x,\nu) = \exp\left(-z(t|x,\nu)\right)$, so that it can be written:

$$\begin{aligned} S(t|x,\nu) \;=\; & \exp(-\exp(\psi_m + x'\beta + \nu)(t - c_{m-1}) + \\ & \sum_{i=1}^{m-1}\exp(\psi_m + x'\beta + \nu)(c_m - c_{m-1})). \end{aligned} \tag{4}$$

[2]For a recent discussion of mixed proportional hazard models, see Van den Berg (2001).

Let t_c denote the completed residential spell, so that the density function $f(t_c|x,\nu) = \theta(t_c|x,\nu)\exp\left(-\int_0^t \theta(u|x,\nu)du\right)$ can be written:

$$\begin{aligned} f(t_c|\nu,x) &= \exp\left(x_i'\beta\right)\exp\left(\sum_{m=1}^{M}\psi_m d_{im}(t)\right)\exp(\nu)\times \\ &\quad \exp(-\exp(\psi_m + x'\beta + \nu)(t - c_{m-1}) + \\ &\quad \sum_{i=1}^{m-1}\exp(\psi_m + x'\beta + \nu)(c_m - c_{m-1})), \end{aligned} \tag{5}$$

and let t_{rc} denote the right-censored residential spell with $f_2(t_{rc}|x,\nu) = \exp\left(-\int_0^t \theta(u|x,\nu)du\right)$, in order to account for the fact that the current spell is ongoing at the end of the observation period.

For the mixed proportional hazard model, the density function from which the likelihood is constructed can be written:

$$f(t|x) = \int_v f(t|x,\nu)dG(\nu), \tag{6}$$

with discrete heterogeneity distribution with two unrestricted mass point locations ν_1 and ν_2, and with associated probabilities denoted by p and $(1-p)$.

4 Empirical Results

In this section we present estimation results for the hazard model of residential mobility of young households. Using these results we consider whether we can say something about young households' housing consumption and housing careers. The estimation results for the hazard model of residential mobility are presented in Table 5 (with reference group indicated by -).

[Table 5 about here]

The first column in Table 5 gives estimation results for a basic specification of a hazard model of residential mobility. Young households' mobility choices are intimately related to current housing consumption, with significantly higher mobility rates in small apartments than in large detached houses. Two reasons for this can be given. First, the diminishing marginal utility with increasing housing consumption makes it less likely to offset moving costs, decreasing households' residential mobility rates with the size or quality of the dwelling (see also Pickles and Davies, 1985; Meen, 2001). Second, the better the dwelling, the lower the chance of finding a dwelling with even better amenities; if households moves to the right side of the housing quality distribution, the probability to improve diminishes.

Estimation results indicate that young households' residential mobility rates vary significantly between regions, consistent with other findings in the literature (see Clark et al., 1986; or Van der Vlist et al., 2002b). The results reveal that particularly in East young households' residential mobility rates are low; significantly lower than in other regions. These differences, as we will see later, relate to differences in housing market and labor market dynamics. East experienced the lowest unemployment growth rate, the greatest rise in the number of jobs, and the greatest rise in the average selling price of the Netherlands in the early 1990s.

The second specification, reported in column two, controls for housing market and labor market changes over time by introducing the year in which the household entered the housing market. These results show the presence of cohort effects in young households' residential mobility rates (cf. Ermisch, 1999; Myers, 1999; Clark and Mulder, 2000). Differences in mobility rates between young households relate to differences in the year they entered the housing market. Results indicate that residential mobility rates are significantly lower in later years for otherwise equal households in similar dwellings. From a public policy point of view, this is an important result, in that cohort effects influence life course patterns of residential mobility and housing career. On the basis of this result, it may be concluded that general economic conditions and housing market conditions are important factors in housing market dynamics as well as in the life course patterns of housing consumption. From a statistical point of view, these cohort effects refer to the initial conditions problem when considering durations without modeling the full residential history (cf. Lancaster, 1990).

This revised specification includes also household type as a time-variant covariate. Estimation results for the revised model show similar housing consumption patterns and do not alter the qualitative findings of the analysis. Consistent with the previous literature (cf. Clark and Withers, 1999, and references therein), these findings suggest that a change in household composition serves as a trigger in residential mobility. The change in household composition shifts housing preferences, generally leading to increased demand for larger housing. Results indicate that, holding household composition constant, mobility rates for one-person households, as well as for two-person households, are significantly lower compared with two-person households with children. In general, most moves of one-person households, as well as two-person households, coincide with changes in household composition, which explains the negative effect on the hazard rate. A similar result is found by Mulder and Wagner (1993) when studying residential mobility and marriage jointly. They find that differences in residential mobility rates between household types are in part due to synchronized changes in household composition.

In Model 3 we consider whether the cohort effects of Model 2 can indeed

be related to time-varying regional housing or labor market characteristics, or that we measured only a time or period effect. For this, we include regional housing market variables like the number of dwellings, average selling price, share of social rental housing and share of small apartments. The estimation results indicate the presence of mainly cohort effects in residential mobility rates; after having corrected for changes in the housing market no statistical effect of the year entering the housing market is found.

The increase in the number of dwellings in the early 1990s increases housing market opportunities of young households, particularly increasing residential mobility rates in East. The rise in average selling price in the early 1990s, however, have significantly decreased young households' likelihood to move (see similarly Börsch-Supan, 1986; Di Salvo and Ermisch, 1997; Ermisch, 1999). Increases in regional house prices, thus does not affect everyone equally; it increases residential mobility rates for homeowners (see Van der Vlist et al., 2002) but decreases residential mobility rates for those who wish to move into first-time homeownership (see also Di Salvo and Ermisch, 1997).

Other regional housing market characteristics that showed no time variation, like the share of social housing and the share of small apartments, only explain inter-regional variation in young households' residential mobility rates. Social rental housing favors young households as regions with a large share of social housing increase the likelihood of finding a dwelling (see also Van der Vlist et al., 2002). This relates to the specific allocation rules to provide affordable housing to low-income households. Monitoring reports indicate that one-person households, and single parents with children have the greatest chance of receiving a social rental unit (see AMA, 2002). Most young households just started their job market career and do have below-modal incomes, explaining the positive sign. Regional differences in the share of small apartments do not affect household mobility rates. Because a larger share of small apartments would decrease the probability to improve residence, $\overline{F}(.)$, one would expect decreasing households' mobility rates. Probably this is because part of the effect is already captured in the average house price.

We included also regional labor market characteristics like unemployment and the job-housing ratio in the analysis. The job-housing ratio, measuring a potential tightness of the housing market, indicate no statistical effect on young households' residential mobility. The parameter estimate of the unemployment rate suggests a negative effect on residential mobility (see similarly Ermisch and Di Salvo, 1997; Hacker, 2000). Yet, the effect is not statistically different from zero.

Before turning to our general conclusions we summarize the main findings of our sensitivity analysis. First, for the baseline hazard, which estimates we suppressed, the estimation results show a non-monotonic shape

of the observed hazard, but no specific duration dependence structure with elapsed duration. Yet, estimation results on the basis of Exponential or Weibull hazard models would give misleading results.

Second, regarding unobserved heterogeneity, we estimated the model with two points of support for the mixing distribution. The results show no unobserved heterogeneity present in the hazard model of new household's residential mobility, in that the mass points converge to the same value. Thus, neglecting the household composition in Model 1 for example, does not give rise to significant unobserved heterogeneity though *Stayers* differ from *Movers* in terms of 1994 household characteristics. On the basis of this result, it may be concluded that no sorting effect is present in observed mobility patterns. As we have seen, this does not, however, imply that changes in the household composition do not trigger residential mobility. All it says is that, at the beginning of the residential spell, agents do not differ in terms of unobserved factors, such as for example heterogeneity in the probability of moving.

5 Conclusion

Young households' residential mobility and vacancy chains play a central role in the functioning of the housing market. Residential moves of young households to bigger dwellings give those who wish to enter the housing market and those housed unsatisfactorily the possibility of entering the housing market or improving their residence, respectively. Also, in housing markets with limited supply, as in many European cities, authorities intervene with rent-controls, a rental assistance program, and eligibility requirements for the social or public housing sector. With a rental assistance program substantial amounts are associated with mismatches on the housing market. This paper empirically investigates young households' housing consumption and residential mobility choices during the early 1990s.

Our analysis show that young households' mobility choices are intimately related to current housing consumption, with significant higher mobility rates in small apartments than in large detached houses. The diminishing marginal utility with increased housing consumption makes it less likely to offset associated moving costs in larger dwellings, decreasing residential mobility rates with housing size or quality. Another reason is that when households move to the right side of the housing quality distribution, the probability to improve housing diminishes, decreasing residential mobility rates. Also, we found that differences in mobility rates between households are related to synchronized changes in household composition. A change in household composition shift housing preferences, increasing young households' residential mobility rates.

Our results indicate considerable variation in mobility rates over time

and across space. The estimation results indicate the presence of cohort effects with significant lower mobility rates in later years for otherwise equal households in similar dwellings. It turned out that these cohort effects can be related to changes in local housing and labor market characteristics during the early 1990s. The results show also considerable variation in mobility rates across space, with significantly lower mobility rates in the core regions than in the regions in the periphery. The higher average house price in the core regions contribute to this finding. The results indicate that increases in regional house prices significantly decrease young households' residential mobility rates. Social rental housing favors young households; regions with a large share of social housing increase the likelihood of finding a dwelling. The specific allocation rules to provide affordable housing to low-income households increase the likelihood of one-person households, and single parents with children to obtain a rental unit. Young households who started their residential career in a social rental housing have more opportunities to move within the social rental housing stock than otherwise equal households who started in a free market rental unit or as an owner-occupier.

These findings have important policy implications. Local housing policies need be much more responsive to changes in local housing markets and demographic dynamics. The sharp rise in house prices in some regions have significantly heighten the affordability burdens faced by young households, especially renters. The high house prices deter households moving out of their (subsidized) rental unit into homeownership, decreasing opportunities for those who wish to enter the rental housing market. The more responsive local housing policies are in the permitting process to changes in housing demand, the more responsive the home building industry can be, the lower the average house price. This suggests that in the communities' interest, building control and building authority need be geared to reducing barriers to the construction of affordable housing, rather than to draw up construction prescriptions only.

Also, public housing rents need to better reflect housing market value. The rental price system as it is now, calculates an average rent on the basis of housing amenities. Long term rental contracts together with a system of rent control and a rigid rental price system creates considerable housing mismatches. For example, households that obtained the cheap rental dwelling years ago, but no longer eligible for a subsidized rental unit, do not move, whereas low-income households and those who wish to enter the housing market have great difficulties obtaining an affordable rental dwelling. About 40% of all renters in Dutch metropolitan areas live in cheap units no longer intended for them. Introduction of a market-based rent system with rental vouchers would help low-income households afford decent housing, also reflecting market prices for those households no longer belonging to the poor.

Acknowledgment

We are grateful to Richard Arnott, Henk Folmer, Peter Kooreman, Jos van Ommeren and Jan Rouwendal whose comments and suggestions on an earlier version greatly improved the paper. Also, we have benefited from the discussions with Frans Dieleman, Cees Gorter, Maarten Lindeboom, Peter Nijkamp and Piet Rietveld. Errors remain our own.

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Table 5. Estimation results for the multi-spell proportional hazard model of young households'residential mobility for several model specifications

	Model 1	Model 2	Model 3
Dwelling characteristics			
Number of rooms	-0.32 (-3.58)	-0.49 (-5.28)	-0.53 (-6.13)
Detached	-1.59 (-2.67)	-1.58 (-2.66)	-1.89(- 2.93)
Semi-detached	-1.19 (-2.76)	-1.17 (-2.70)	-1.41 (-2.93)
Corner	-0.69 (-2.03)	-0.73 (-2.13)	-0.90 (-2.55)
Terraced	-0.20 (-0.94)	-0.25 (-1.19)	-0.46 (-2.07)
Apartment	-	-	-
Region			
North	-	-	
East	-0.76 (-2.84)	-0.71 (-2.66)	
South	-0.49 (-2.02)	-0.52 (-2.13)	
West	-0.74 (-3.46)	-0.82 (-3.83)	
Urbanization			
Highly urbanized			-
Urbanized			0.67 (3.03)
Rural			0.30 (1.29)
Regional housing market			
Average selling price			-0.05 (-1.91)
Share social housing			0.07 (1.49)
Share apartments			0.01 (0.40)
Regional labor market			
Unemployment rate			-0.01 (-0.23)
Job-housing ratio			0.10 (1.05)
Year entering the housing market			
1990		-	-
1991		-0.27 (-1.53)	-0.06(-0.18)
1992		-0.59 (-2.45)	0.54 (0.84)
1993		-1.83 (-3.07)	0.19 (0.15)
1994		-4.42 (-0.21)	-4.63 (-0.00)
Household characteristics			
Head		-1.71 (-6.78)	-1.74 (-6.42)
Head and child		-1.45 (-1.43)	-1.39 (-1.39)
Head and partner		-1.20 (-6.72)	-1.21 (-5.36)
Head, partner and child		-	-
Multiple households		-1.51 (-1.49)	-1.33 (-1.07)
Log-likelihood	-1173	-1132	-1123

- Models are estimated with four baseline parameters; t-values in parentheses.